

# **Energy-Saving Opportunities at Water/Wastewater Plants**

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# **Why is Energy an Issue at Water/Wastewater Plants?**

- **Most Water/Wastewater Plants are 30 to 50 years old**
- **When constructed energy efficiency was not an issue**
- **Very little has changed at these plants in the last 50 years**

# Today's Opportunities

- **Energy efficiency opportunities include:**

-  **Equipment modifications**

-  **Load shifting**

-  **Energy management**

-  **Operational changes**

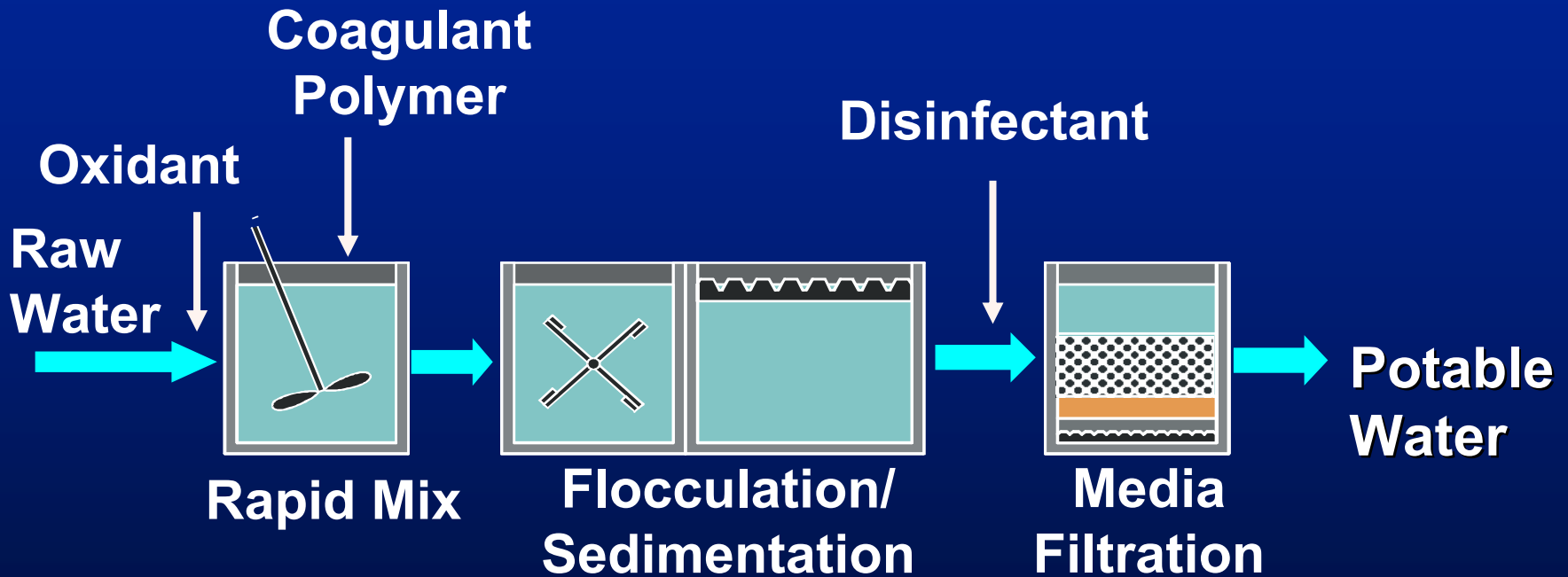
-  **HVAC changing**

-  **Lighting retrofits**

# Municipal Water Treatment



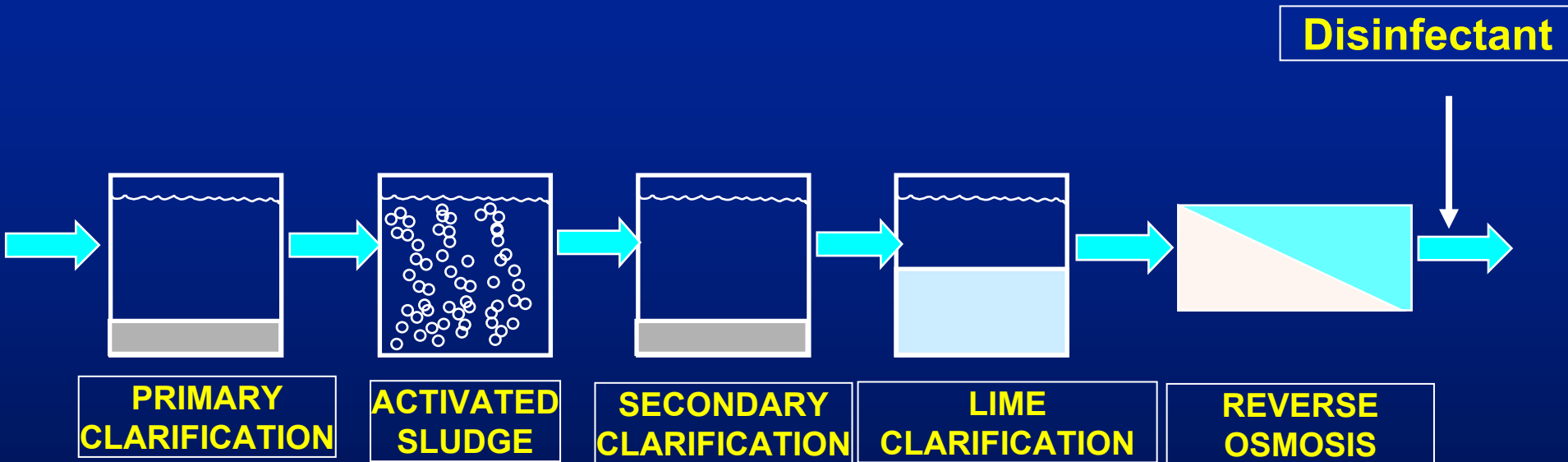
# Conventional Drinking Water Filtration Plant



# Wastewater Treatment



# Wastewater Reclamation Treatment Processes



# **CEC Funded Energy and Process Assessment**

- **2 municipal water and 2 municipal wastewater facilities studied**
- **Facility assessments**
  - ⦿ **Analyze energy use versus water quality processing characteristics**
  - ⦿ **Determine equipment for improvements/modifications**

# Energy and Process Assessment Project Locations



City of San Francisco (Sonol WTP)

City of Half Moon Bay (WWTP)

City of Riverside (WWTP)  
MWD (WTP)

# Objectives

**Optimize energy and chemical  
consumption**

**Improve process performance**

**Introduce technologies that  
impact the above**

# Energy Optimization Summary for 7.5 mgd WWTP

No.	Description	Savings	Cost	Recommend
1	Add Small RS Pump	\$5,680	\$41,400	No
2	Use Only One RS Pump	\$15,380	\$6,000	Yes
3a	Add Small TF Pump	\$33,200	\$81,500	No
3b	Add VFD to TF Pump	\$33,200	\$62,000	Yes
4	Reduce Channel Air	\$4,040	\$200	Yes
5	Reduce Digester Mixing	\$8,900	\$200	Yes
6	Replace Digester Recirc Pump	\$5,900	\$26,500	Yes

# Energy Optimization Summary (cont.)

No.	Description	Savings	Cost	Recommend
7	Avoid On-Peak Cogen Shutdown	\$20,000	---	Yes
8	Load Shed When Cogen is Down	\$13,700	---	Yes
9a	VFD on No. 3 Water Pump	\$3,680	\$14,600	No
9b	Lower No. 3 Water Pressure	\$2,458	\$5,300	Yes
10	Minimize Natural Gas in Boilers			N/A
11	Used Flared Digas in Cogen	\$8,000	---	Yes
12	Change to Cogen Gas Rate	\$76,397	\$5,000	Yes
13	PG&E Lighting Audit	\$2,530	\$8,500	Yes

# Major Quantitative Energy Saving Benefits

- Over 8.5 million kWh/yr of energy conservation measures were identified
- Corresponding energy efficiency improvements were:
  - ⦿ 8 to 15% at water plants
  - ⦿ 15 to 33 % at wastewater plants

# **Major Quantitative Energy Saving Benefits (cont.)**

- **880 million kWh/yr energy savings potential for California**
- **The overall CEC contract will result in 150 million kWh/yr energy savings**

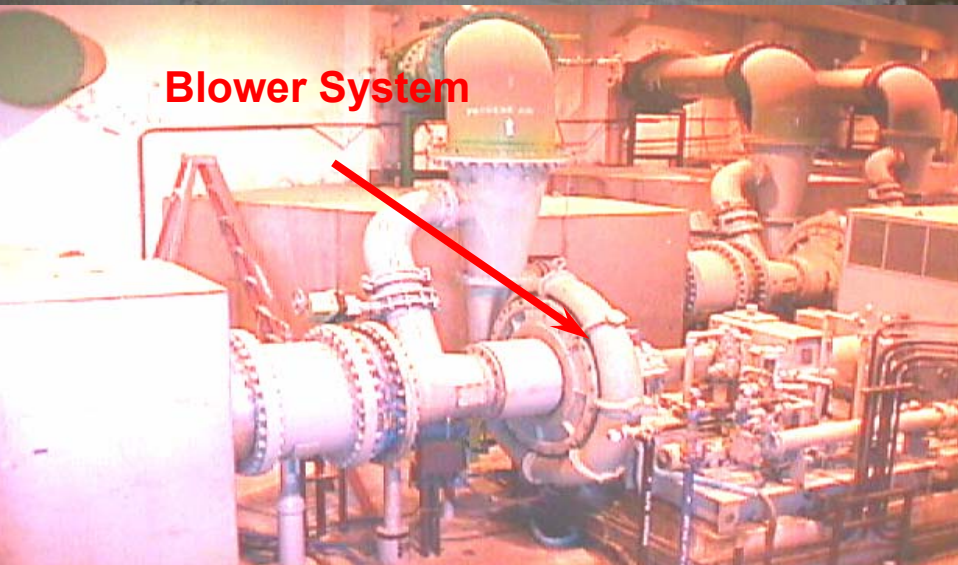
# Potential Benefits to California

- **Energy and water conservation**
- **Productivity improvement at water and wastewater plants**
- **Plant throughput increase (wastewater)**
- **System cost reduction**
- **Waste and chemical-use reduction**

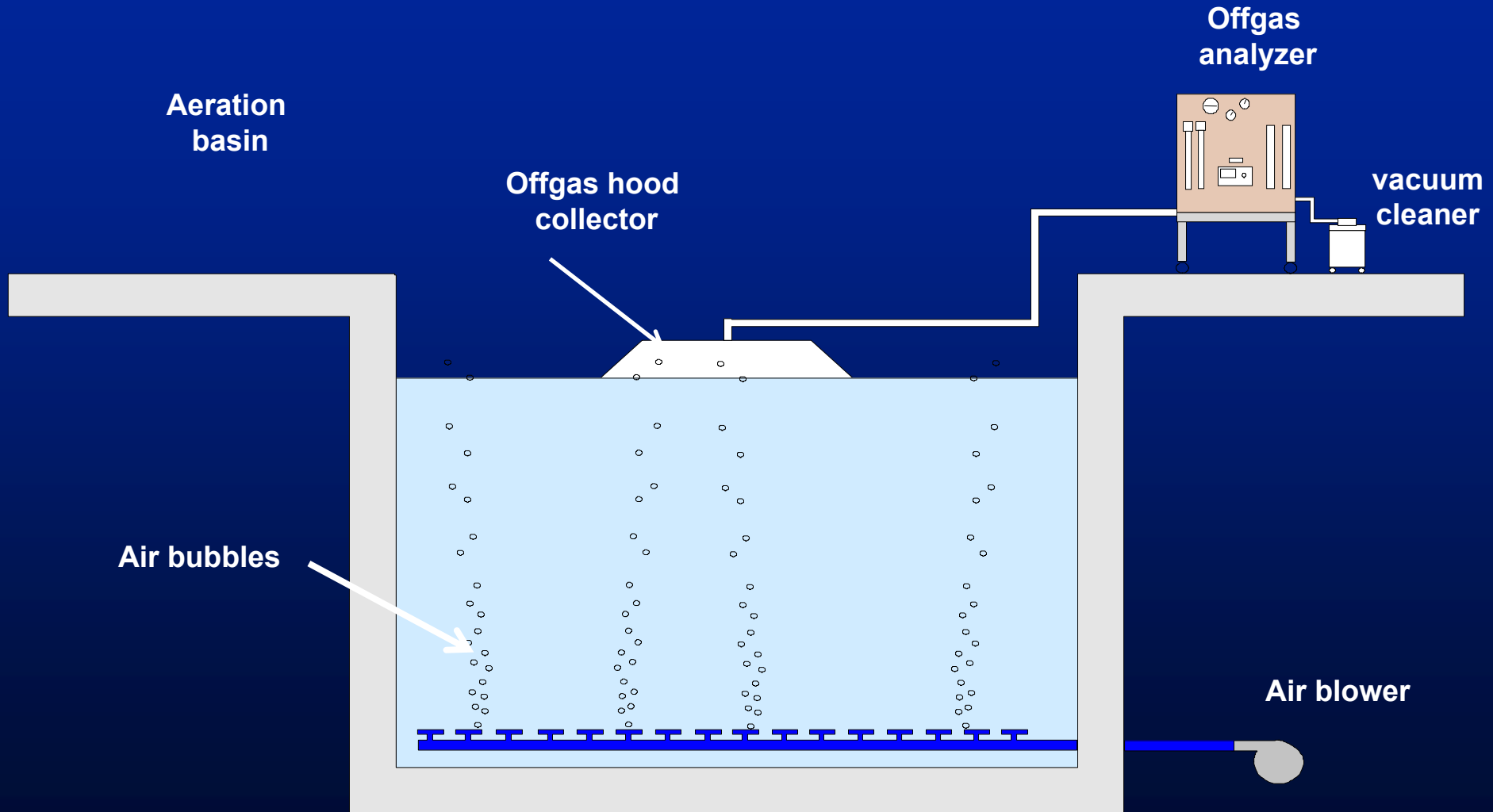
# **Energy Conservation in Wastewater Aeration**

- **Over 50% of total energy use is in aeration treatment**
- **Demonstrated potential for at least 40% energy saving at pilot and prototype scale**

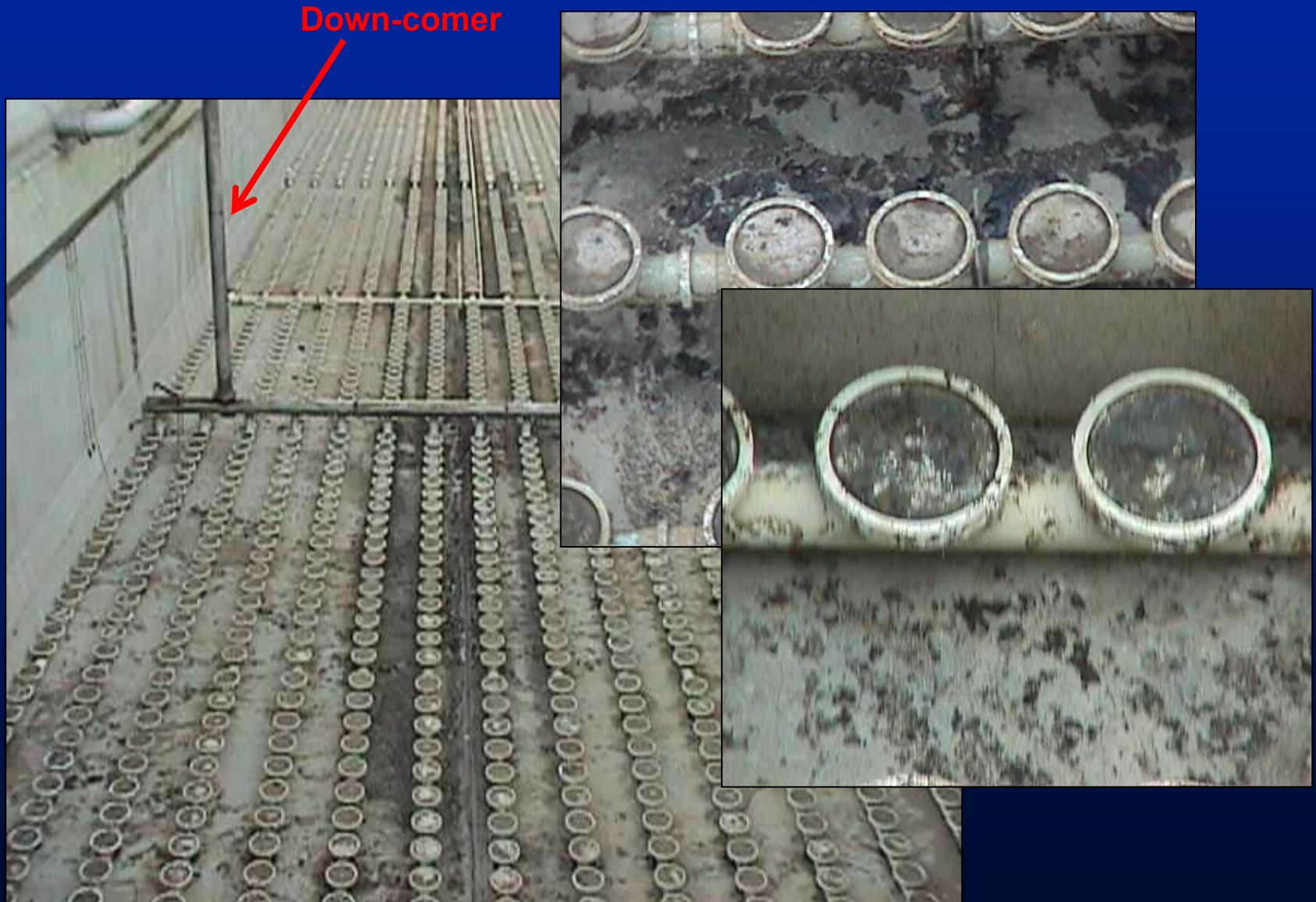
# Wastewater Treatment Primary Energy Users



# What is oxygen transfer efficiency (OTE)?



# Air distribution system with fouled diffusers



# Technology Status and Benefits

- Ready for full scale demonstration at four commercial wastewater plants by October
- Potential Benefits to California
  - ⌚ Energy savings of at least 600 million kWh annually

# Issues and Technologies on the Horizon

## ■ California Toxic Rule

⦿ Lower heavy metals in wastewater discharge by 1/10th

➤ RO

➤ Ion exchange

➤ Wetlands

# Issues and Technologies on the Horizon

- THM reduction

- ⦿ Manganese coated oxides to remove THM

- Increase COD/BOD removal in activated sludge

- ⦿ Enzyme added to wastewater

- Increases oxygen uptake

# Issues and Technologies on the Horizon

- **Wastewater sludge dewatering enhancement**

- ⚙️ **Electrical charge on belt press**

- **More efficient dewatering**